

**Source:** [Newsday](#), November 30, 2001.

## **A Solution For Anthrax Mystery**

*Study: Spores seep through paper*

By Earl Lane, WASHINGTON BUREAU

Washington - Researchers have determined how fine-grained anthrax spores of the type sent in a [letter](#) to Sen. Majority Leader Thomas Daschle (D-S.D.) can tunnel directly through pores of the envelope during mail processing.

That would explain how spores could escape into mail-processing facilities, cross-contaminating other letters and affecting workers, even though the Daschle letter, and a recently discovered one addressed to Sen. Patrick Leahy (D-Vt.), reportedly were sealed with tape.

Experts earlier had said it would be possible for spores to puff out of the unglued openings at the ends of an envelope flap. But several had questioned how readily spores could escape from a well-sealed envelope.

E.J. Rice, vice president for development at the Institute of Paper Science and Technology in Atlanta, said this week that tests sponsored by the institute suggest there may be thousands of microscopic tunnels infiltrating the paper of a typical envelope.

"We are of the opinion now that it [anthrax powder] is able to come through" the paper, Rice said.

David Rothbard, an associate scientist at the institute, said, "It is not unusual to find pore connections on the order of five microns or larger" in envelope paper.

Such connections, under the right conditions, would provide passageways for the escape of the 1.5- to 3-micron particles found in samples of the anthrax powder mailed to Daschle.

Particles in the 1- to 5-micron range can be inhaled readily and can cause the potentially lethal inhalation form of anthrax. Such particles, much smaller than a dust mote, can float in the air like a gas once released, experts say. (A human hair is about 100 microns in diameter.)

The Leahy letter, discovered Nov. 16 in a barrel of unopened congressional mail, has been described by an Army scientist as leaking anthrax spores "like a sieve." After careful preparations, investigators at the Army's Fort Detrick biodefense facility in Maryland were planning to open the letter by today and begin a physical and chemical examination of its contents.

Paper, at the microscopic level, "is almost like spaghetti that's been cooked and laid in a pile," Rothbard said. "There are a number of pathways that go through." Such pathways can allow finely milled anthrax spores to escape when a sealed envelope is squeezed by mail-processing equipment or other handling.

The key factor, Rothbard said, is how well the voids and passages through a paper sample are connected. The porosity depends on such factors as the kinds of wood pulp used, the amount of recycled materials and the mineral fillers in the paper.

In one test sponsored by the Atlanta institute, liquid mercury was pressed through paper samples at various pressures. The smaller the pore openings, the greater the pressure required to force the mercury through them. By measuring the volume of mercury that intrudes at different pressures, the size of the pore openings can be calculated.

In another test, performed for the institute by Resolution Science Corp. of Corte Madera, Calif., scientists took images of successive horizontal slices (each 1-micron thick) from a piece of envelope paper. A computer used those images to create a three-dimensional structural view of the paper, revealing the fibers, fillers and voids in great detail.

The researchers did not test the transmission of particles of specified sizes through the paper nor did they estimate how many 5-micron channel or larger openings an envelope might contain.

But Rice said "there would be thousands of those pathways." If so, it could explain how hundreds or thousands of spores at a time could leak from an envelope.

While animal studies suggest that half of those who breathe in about 8,000 to 10,000 anthrax spores will develop potentially deadly inhalation anthrax, experts now say it may take substantially fewer spores to trigger the disease in some cases.